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Editorial

Elsewhere in this issue will be found an account of rice cultivation in Japan and how far we in India could copy them. As the authors have pointed out, it is not, either in knowledge or in technique that we lag behind, but it is in the efficiency of organisation, the sense of discipline and the thoroughness with which the results of research are carried to the very doors of individual farmers, that we lag behind the Japanese. Though this example of how an industrious and well-disciplined nation has achieved a self-sufficiency of 85 per cent of their food requirements out of an infertile, hilly terrain, is no doubt an inspiring model for us to emulate, it also gives room for a little doubt, as to how far our present food crisis and clamour for more production without achieving it, are due to our lack of discipline for the common good. As a people we are never tired of harping on our glorious past and incidentally letting the present slide away beneath our feet.

Just as we are apt to think that if only we had a splendid miniature camera, with all the gadgets and costing a thousand rupees, we could turn out splendid photographs, forgetting the simple fact that it is the man behind the camera that makes good pictures and not the camera, which is after all, merely a tool, so in agriculture too, we are often apt to imagine that a supply of all the latest in tractors and disc ploughs, and plenty of fertilisers to supply all the elements from nitrogen to molybdenum, would automatically ensure bumper crops everywhere, and forget the fact that an improvement in the basic material, man himself and his desire to work for the common good, is equally important.

In this connection it may be worth pondering over the random quotation given below, from Alice in Wonderland. No comments are made, because none is needed.

Alice was running hand in hand with the Queen of Spades, and just as fast as she could, but she was surprised to find that she was not getting anywhere. The Queen said, "What did you expect?" "Well," panted Alice. "in our country you would generally get to somewhere else, if you run like this." "That's a slow sort of country," said the Queen "Now, here, it takes all the running you can do to keep in the same place. If you want to get to somewhere else, you must run at least twice as fast as this."

Flowers are the fine clothes that a plant puts on, when it needs to attract attention.

Gleanings

Partial Restriction of DDT in the United States

DDT has been banned in the United States for use around dairy barns, on dairy cattle, and on crops grown for cattle forage.

According to advice recently received from America, this is due to DDT showing up in the milk. The United States Food and Drug administration states;—

"Small amounts of DDT are not harmful to man as such; the trouble is that the human body does not easily get rid of DDT.

"Consequently, even minor quantities over a long period of time can reach an undesirable concentration.

"A warning has therefore been issued by the United States Department of Agriculture that all labels recommending the use of DDT on dairy animals, dairy barns, animals being finished for slaughter, or on forage or other feed for animals, must be appropriately revised".

In addition the United States Department of Agriculture (Agricultural Research Administration) has issued a statement authorising the use of sprays based on pure gamma isomer of BHC (which is almost free of the characteristic musty odour of crude BHC) for fly control in dairy barns.

This substance, which is known as Lindane, is applied at the rate of 1 gallon to 500 square feet of surface (at a concentration of 0·3 to 0·5 percent).

Space or air sprays of pyrethrum may also be used within the dairies. — ENTOMOLOGICAL BRANCH.

(*Agri. Gaz. of New South Wales, 1950.* Vol. 61, 202)

Thin Napier Grass (*Pennisetum polystachyon* Schult.) A useful fodder for semi-dry tracts

By

S. G. AIYADURAI B. Sc. (Ag.)

Agricultural Research Institute, Coimbatore.

(Received 22—6—1950.)

Introduction: In the South Arcot district where the summer heat often reaches 110° or 112° F., it is very difficult for any fodder grass to thrive during that part of the year. Consequently there is always a shortage of fodder in the tract during the summer months. The well-known fodder grasses viz., Guinea grass and Napier grass come up and yield well only under favourable conditions of water supply. These grasses are also not drought resistant. Therefore the need for a drought-resistant fodder grass which will be capable of yielding some fodder during summer was keenly felt. In 1940 a report appeared in Indian Farming (Vol. 1, No. 12, Dec. 1940) that a grass known by the name of * *Pennisetum purpureum* and popularly called Thin Napier or Dry Napier grass was grown successfully in Mysore and that it proved to be a promising fodder grass for growing under rainfed conditions. The original home of this grass is said to be Tropical Africa. It was reported a crop of this grass raised by transplanting 40 to 60 days-old seedlings yielded green stuff of about seven tons per acre in three cuttings. Mention was also made that this grass, even after repeated cuttings, remained tender and did not become fibrous. The grass was said to give cuttings for nine months in the year. Curiously enough, though this grass had been collected by Dr. C. A. Barber as early as 1902, as revealed in the Madras Herbarium, Coimbatore, it was missed by the Department till it was published in Indian Farming. In order to study the performance of this grass at other places in South India, seeds were obtained from the Department of Agriculture, Mysore and the crop raised was under observation for a period of about four years. This note gives a brief summary of the observations recorded at the Agricultural Research Station, Tindivanam (South Arcot) where the average rainfall amounts to 42 inches distributed as follows:

Periods	Average rainfall for 9 years.
South-West monsoon	12·3"
North-East monsoon	21·7"
Hot Weather	8·0"
Total	42·0"

* The name has since been shown to be erroneous by Sri N. Krishnaswami and N. Hrishikesan Nair. The correct name is given as *Pennisetum polystachyon* (vide Madras Agricultural Journal, Vol. XXXVII, No. 5, Page 207).

Preliminary observations: The seeds were broadcasted in August 1941 at the rate of 5 to 6 lb. per acre in a plot of land brought to a friable condition by two ploughings, two harrowings and clod crushing. Cattle manure was applied at the rate of 10 cartloads per acre. A transplanted crop was also raised in a plot adjacent to the broadcast area. The seedlings were raised in a nursery and then transplated on ridges spaced 2 feet apart, giving a spacing of 1½ feet in the row. The seed germinated in about 10 days and the seedling grew well. The first cutting from the transplanted area was taken three months after planting, and in about 3½ months from the broadcast area. During rainy months it was found possible to take a cutting every alternate month but during the hot weather period only one or two cuttings could be taken. Though the crop showed diminished growth during the summer months it revived after the receipt of South-west monsoon rains and grew up satisfactorily. When there was a slight lull in the South-west monsoon rains the crop was given intercultivation every year by ploughing along the furrows and manured with cattle manure at the rate of 10 cartloads per acre. No further seeding was found necessary for the first few years. The yield of green fodder obtained for the period during which the crop was under observation is given separately for the broadcast and transplanted areas.

Yield of Thin Napier Grass from the Observation Plots During 1941—42 to 1945—45.

	Transplanted Area (Planted on 7—10—1941)		Broadcast Area (sown on 24—10—1941)	
	No. of cuttings	Total acre yield of green stuff in lb.	No. of cuttings	Total acre yield of green stuff in lb.
1941—42	6	23,350	6	20,725
1942—43	7	21,780	7	24,375
1943—44	5	12,977	5	14,375
1944—45	5	10,020	5	11,745
Total	23	68,127	23	71,220

From the above statement it may be seen that the yields of green fodder from both the areas are almost similar and they get reduced with advance in age. However, raising the seedlings and transplanting them in ploughed fields in rows seems to be the better method of growing this fodder grass as it will lend itself to intercultivation and manuring. Also cuttings can be taken easily in plots when the grass is planted in rows. But broadcast planting yielded slightly more fodder in the five-year period.

Comparative yield trials: As the results of the preliminary observations were encouraging it was considered worthwhile to compare the

performance of this grasss with that of [the other two grasses that are usually raised for fodder. The three grasses were raised in a randomised block replicated layout and yields obtained from the different plots during a period of two years were recorded. The acre yield (average of two years) of green fodder obtained is furnished below :

Name of grass	Average annual yield per acre in pounds
Thin Napier grass (Tn)	16,632
Napier grass (N)	21,582
Guinea grass (G)	12,500
Standard error	410
Critical difference (P=0·05)	2129·0
Conclusion—N > Tn >G	

Of the three grasses Napier grass proved to be the best yielder with an annual tonnage of about 9 tons, followed by Thin Napier grass which yielded about 7 tons of green stuff per annum. The yield of Guinea grass averaged only about 5 tons per annum. In these trials the drought resistant nature of the Thin Napier grass was clearly in evidence. It gave a better tonnage of fodder than ordinary Napier or Guinea grass during the summer months (February—May) as can be seen from the following statement :

Name of Fodder	Acre yield (in pounds) obtained during summer (Average of two years)
1. Thin Napier grass	12,735
2. Napier grass	9,780
3. Guinea grass	8,340

Trials carried out at the Coconut Research Stations on the West Coast have also shown that the Thin Napier grass can be successfully grown under rainfed conditions.

Palatability : The utility of a fodder grass depends among others on the nutritive value of the grass and its palatability. The following statement gives the results of analysis of the three fodder grasses, done by the Government Agricultural Chemist, Coimbatore.

—	Thin Napier grass	Napier grass	Guinea grass
Moisture	7·40	7·81	8·21
Ash	7·64	7·49	7 81
C. protein	7·35	8·80	9·23
C. Fibre	31·20	29·02	28·00
E. Extractives	1·63	2·42	2·40
Carbohydrates	44·78	44·46	44·35
Nitrogen	1·18	1·41	1·48
Lime (Ca 0)	·56	0·80	·93
Ph. acid (P_2 O_5	·26	·23	·23
Insolubles	4·18	1·77	2·92

It may be seen that from the nutritive point of view Thin Napier grass is closely similar to the other two Napier and Guinea grasses.

If the cattle relish the fodder the rejected materials in the feeding trough will naturally be very little. In order to determine the palatability of the above three fodder grasses, weighed quantities of green stuff were fed to cattle and the rejection in each was noted. The results are as follows :

Name of fodder	Quantity fed to cattle over a period of 8 days	Qty. rejected by the animals (equivalent to its original wet weight)	Percentage of rejection
	lb.	lb.	
Thin Napier grass	320	40	12·5
Ordinary Napier grass	320	16	5·0
Guinea grass	320	100	31·2

It is seen that the quantity of rejection is least in ordinary Napier grass and maximum in Guinea grass, the Thin Napier grass occupying an intermediate place. It, is thus evident that cattle relish the Thin Napier grass much better than the Guinea grass, at the Agricultural Research Station, Tindivanam.

Conclusions: The results of the trials discussed above go to substantiate to a certain extent the claims made for Thin Napier grass regarding its yield, drought resistant nature and general suitability for raising under rainfed conditions and in situations where irrigation facilities are lacking. There appears to be a good scope for popularising the cultivation of this grass for fodder purposes in drylands as it will go a long way in mitigating the scarcity for fodder grasses which invariably occurs during summer months in dry districts.

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A Horticultural Programme for the Irrigation Project Areas

By

L. KRISHNAN, B. A., B. Sc. (Ag.), Horticultural Trainee.

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Introduction: Horticulture is defined as the cultivation of plants for consumption or ornament, as distinguished from field crops, sylviculture or forestry; Hortus meaning garden and culture being cultivation, by horticulture is meant cultivation of garden crops.

While there are several schemes to increase the area under cereals, and some mention is discernible for increasing the area under vegetables, a comprehensive plan is still to be worked out for the development of fruit crops, which alone in the opinion of the author can effectively help to solve the food crisis. However, it will be only ignoring the facts, if fruits are intended to replace the cereal diet. The aim is only to supplement and not to substitute the normal diet. Fruits being appetisers and health promoters, the horticultural approach alone can provide a lasting solution to the devitalising food deficit. In preparing this paper the author has freely drawn information from several published and unpublished records. The paper deals mainly about fruit crops, as regards their importance, their responses under different environments and the possibilities for their extension, particularly in the irrigation project areas.

Data and findings: Dr. Akroyd prescribed the following formula as a well-balanced diet to supply 2600 caloris to an average adult:

Rice	...	10 oz.	Nonleafy vegetables	...	6 oz.
Millets	...	5 oz.	Green leafy ,,	...	4 oz.
Milk	...	8 oz.	Fats and oils	...	2 oz.
Pulses	...	3 oz.	Fruits	...	2 oz.

Working on the above basis and referring to the actual cultivated area and yields the "Eastern Economists" (1944) arrived at the conclusion that for balanced food the following increase in existing production is the minimum:

Food stuff		Percentage increase required	Food stuff		Percentage increase required
Cereals	...	10	Fats and oils	...	250
Pulses	...	20	Milk	...	300
Fruits	...	50	Fish and eggs	...	300
Vegetables	...	100			

The area under fruits and vegetables in the year 1947—48 is given as 8 lakhs of acres. As per figures given above the area has to be increased approximately by another four lakhs to meet the deficit in fruits alone. In the matter of food grains the deficit as already noted is 10% or 4 million tons. This deficit can to a great extent be made up with fruits and vegetables. As these two commodities are already lacking in the diet and intake of grain food can be reduced, extended cultivation of these two types of foods deserve consideration on the following grounds also:

(a) Besides under-nutrition people suffer from mal-nutrition on account of the deficiency of minerals and vitamins in their diet. Vegetables and fruits meet these needs;

(b) Maximum outturn per unit area can be obtained by cultivating fruits and vegetables;

(c) Total calories required to maintain normal health by taking cereals can be reduced to nearly 50%, if admixed with sufficient fruits and vegetables.

(d) Depending on the nature of fruit crops more area can be commanded with the same water given to an acre under paddy. Thus the available water can be utilised for increased return in the shape of food.

Even under purely rainfed conditions as in West Coast and hilly regions of lower Palanis, Nilgiris and Shevaroys very good yields are obtained from fruit trees. Besides extending the area under fruits in such places to augment production, the irrigation projects deserve due consideration in view of its potentiality. Alexander Joss of "the Bureau of Agricultural Economics, U. S. A." states "benefits from irrigation arise only through increased prduction which the irrigation water makes possible. Benefits may be large or small depending on crop responses. They tend to be highest in extremely arid regions and to approach zero in areas where the rainfall meets the optimum needs". Canals, wells and tanks or the three sources of irrigation mainly tapped. Under irrigation projects canal irrigation alone is taken up for consideration.

The situation resolves to the selection of compact areas for fruit growing and choice of fruit plants suited to the site. The areas can be;

1. Cultural wastes in the vicinity of irrigation projects to which water can be pumped for orchard enterprises. It is already reported that 94% of water flowing in rivers runs to waste and though this may happen during monsoons, setting up irrigation in a dry area will help to raise water table and wells can be tapped in such areas to supplement project irrigation. Further, in projects catering mainly to paddy

cultivation only gravitational flow is thought of. For fruit trees water can be pumped and as only few irrigations are required in a year, this is a feasible proposition.

2. In the new projects and in old projects high level blocks adjoining the projects can be located for orchards.

3. Even in the projects, certain branch canals can be set apart to serve fruit cultivation taken up at higher levels. This will also facilitate increasing available supply in other canals for a double crop of paddy where now only single crop is taken, even by extra fertilising those lands. This allocation and zonal system of fruit cultivation is possible especially in the projects like Cauvery-Mettur project.

However, in selecting soils for fruit cultivation, the following five conditions are pre-requisites:

1. A site with minimum depth of soil of at least six feet of uniform texture not ingrained with impervious layers of rock or hard substratum and neither too open nor too stiff to hinder root development;

2. The water table of the site should not rise within six feet of the surface soil even in the wettest period of the year.

3. Availability of a perennial and plentiful supply of sweet water for irrigation;

4. Wind-swept sites should be avoided, but when they are inevitable, the site may be well protected by barriers such as thick wood belts.

5. Nearness to the road and preferably to a railway station is a point of no mean value in the establishment of a fruit farm.

Further, locating sites for fruit cultivation near or in projects demand careful consideration, for ensuring adequate drainage without which the venture will only lead the grower to grief. The decline of *Vadlapudi* orange in the Bezawada tract is attributed mainly to the high water table and ill-drained conditions. In places where adverse conditions as high water table or lack of irrigation facilities during certain periods can not be avoided, plants suited to such conditions are to be chosen.

From site selection to marketing of the produce the growers should be given assistance not only financially through co-operative concerns but also technically by organising well-equipped field workers drawn from the horticultural training course who will help to translate the results of fruit research in the field. Government or licensed nurseries should operate to meet the needs for plants.

SUMMARY AND CONCLUSIONS

1. The food deficit and progressive increase in population demand a lasting solution;

2. The value of fruit crops as to their calorific value, yield per acre, vitamin and mineral content and the possibility for maintaining a much greater area under fruits and vegetables with the same amount of water required for paddy are factors that should not be ignored;

3. A "Grow more fruit" campaign should form part of the present "Grow More Food" campaign for satisfactorily resolving the food crisis;

4. Fruit crops are to be cultivated not to substitute the bulky cereal food but only to supplement the latter since by blending both, the diet is balanced. By this judicious mixture in the diet the mal-nutrition that is now experienced can be overcome, besides meeting the under-nutrition;

5. Fruit cultivation is to be given preference in new areas taken up for cultivation or even by setting apart existing suitable areas, since fruits yield several times more per acre than other annual crops;

6. Fruit growing zones are to be demarcated in the irrigation projects with due regard for soil, topography and suitability of the plant to the prevailing climatic conditions and environment, utilising a percentage of the river water that at present flows into the sea and gets wasted;

7. Regular and periodical supplies of water in the channels are to be earmarked to serve such fruit zones, especially during off-season ar some other alternative arrangements as sinking of wells to serve in the off-season provided;

8. Drainage of the area has to be maintained in perfect order by digging drainage channels or sinking adequate number of tube wells for baling or pumping out the subsoil water;

9. While the maintenance of the main drainage channels should be a Government concern there should be a benevolent compulsory legislation, if need be, to provide drainage facilities to respective sites by individuals concerned.

10. Orcharding being a long-term venture, a scheme similar to the well subsidy scheme but more generous than this, should operate in the proposed areas, granting long-term loans, free of interest to ryots for horticultural development;

11. A co-operative combine has to be operated in these areas for collective purchase of materials required for cultivation, manuring, spraying and disposal of produce. In helping the ryots in the different stages — from the selection of site and choosing the plants to harvest of produce — well-equipped horticultural trainees have a responsible role to play.
12. In these days of "Produce or Perish" the lasting solution for the food problem thus depends on a coherent and sustained policy of a planned and coordinated development of horticulture in the irrigation projects.

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"Extract from F. A. O. Publication on Rice"

The Rice study group in the F. A. O. consisting of representatives from the several member countries met at Trivandrum in 1947 and later at Bangkok and have formulated far-reaching recommendations concerning every aspect of rice culture. There are long-standing problems of which have yet to be tackled and solved by concerted action of all institutions interested in the rice industry. One section of the Committee wanted that a permanent Rice Section of the F. A. O. should be constituted "with a permanent Rice Study Group which will be a world body and which will be in-charge of the modernisation of rice culture as far as is feasible and will be in direct charge of the rice allocation, as well as collection and dissemination of all statistical and technical information regarding rice and will keep a constant watch on the continually and rapidly changing situation in Rice." But another section of the Committee, led by the Indian delegate Sri S. V. Ramamurthy, was emphatic that the Eastern countries must have a major voice in all the above matters and sponsored the setting up of a permanent Rice Board in South-East Asia as 80·% of the production and consumption of rice is in South-East Asia. Hence measures designed to increase production, allocation and consumption of rice should be discussed and decided up in South-East Asia itself and the present arrangement of the administration of rice, reserved in the hands of a body situated in Washington is not sound. But this move was defeated by a large majority.

Amongst many suggestions the following recommendations were made for consideration by the member Governments.

Improvement and standardisation of statistical and economic data relating to rice:— For securing uniformity in use of terms to represent the several classes of rice used in the several countries the following recommendations were made.

1. That, for the purpose of international analysis and comparison, each country report the statistics pertaining to its rice industry to F. A. O. in metric tons and in hectares.

2. That, as a first step toward securing a fair price for the producer and facilitating trade, each country that has not already done so, take necessary action to introduce and establish its own standard weights and measures for rice.

3. That F. A. O. undertake to consult with other international agencies or organisations having an interest in the standardisation of weights and measures and prepare a report for the next meeting of the Council of F. A. O. such report to be made available to member Governments.

Recommended terms	Definition	Comments
Paddy	... Rice in the husk after threshing.	
Rough Rice Stalk Paddy	... Unthreshed rice in the husk harvested with part of the stalk.	
Husked Rice	... Rice from which the husk only has been removed. It still retains the bran layers and most of the germs.	Commonly referred to as 'Brown Rice' even though there are varieties having red or white bran coats. In some regions called 'hulled rice' or 'cargo rice'.
Milled Rice	... Rice from which the husk germs, and bran layers have been substantially removed by power machinery.	Rice can be milled to various degrees. If milled to a high degree it is generally called 'white rice'.
Undermilled rice	... Rice from which the husk germs, and bran layers have been partially removed by power machinery.	Called 'unpolished rice' in the United States.
Hand-pounded rice	... Rice from which the husk, germ, and bran layers have been partially removed without use of power machinery.	Also called 'home-pounded rice'.

Recommended terms	Definition	Comments
Coated Rice	... Rice milled to a high degree then coated with a foreign substance such as glucose or talcum.	Called 'polished rice' in Europe. In the United States the term 'polished rice' is used, however, for rice which has been milled to a high degree and which has gone through the brush. In Japan the same term is used for highly milled rice treated with polishing powders. The term 'polished' therefore causes much confusion.
Whole grain rice	... Husked, milled, or home-pounded rice which does not contain any broken grains smaller than three-quarters of the whole kernol.	The term 'whole rice' is some times used for husked rice but also for whole grain rice and therefore causes confusion.
Broken Rice	... Husked, milled or home pounded rice, consisting of broken grains, smaller than three-quarter of the kernels.	Various classifications or broken rice are in use by the trade.
Brewers Rice	... Very small broken rice.	Generally used for industrial purposes.
Husks	... By product from the milling of rice, consisting of the outermost covering of the rice kernels.	Also called 'hulls' or 'chaff'.
Bran	... A by-product from the milling of rice, consisting of the outer bran layers of the kernels with part of germ.	
Rice Polishings	... By produce from the milling of rice, consisting of the inner bran layers of the germ and a small percentage of the starchy interior.	Also called 'rice meal' or 'rice flour' in some regions. At the present time there is no appropriate term.
Parboiled Paddy	... Paddy which has been specially processed by steaming or soaking in water, heating (usually by steam) and drying.	

Note :— Parboiled paddy can be milled to various degrees or home-pounded in the same way as ordinary paddy and will then be called parboiled milled', 'parboiled home-pounded' rice etc.

The term 'raw rice' is sometimes used in India to indicate that rice has not been given any heating treatment, such as parboiling.

Glutinous rice is a special botanical variety of rice which, after cooking, has a peculiar stickiness regardless of how it is cooked. It can be milled to various degrees or home-pounded in the same way as ordinary rice and will then be called as 'glutinous milled' 'glutinous home-pounded' rice, etc.

Increasing rice production by expansion of area and by improvements in culture. There are significant areas for increasing area of rice cultivation provided adequate irrigation, drainage, communication facilities and measures for the protection of life, health, and property are set up.

Irrigation and drainage; Drainage is very important and remunerative aspects of irrigation and drainage projects should not always be judged as the main criterion, but benefits to community must also be taken into consideration. Smaller projects are more useful than larger schemes.

2. River training as in Pegu and Tharavady districts in Burma may be investigated.

3. *Prevention of water wastages.* It is felt that selling water on volumetric basis is more sound than crop-acre basis. In areas having high temperature, low rainfall high evaporation and inadequate drainage, the latter method tends to bring on alkalinity.

4. Timely supplies of water are very important and all projects must be properly developed on this understanding.

5. *Land development and reclamation* — Areas of really cultivable waste lands that could be reclaimed are very few and reclamation development in areas awaiting of reclamation are to be taken up only by Government agencies. Possibilities of reclamation through 'River silting control' similar to the case of rivers of Burma which is increasing its land under rice by 'accretion' may be considered. Reclamation of mangrove swamps can be attempted only with the help of anti-malarial measures, costly and organised schemes for clearing and drainage of lands and colonisation. The following recommendations have been made by the Governments concerned :—

(i) 'Cultivable waste lands' has to be defined more precisely.
(ii) Survey parties should be organised to obtain correct acreages of such lands.
(iii) Control of diseases and supply of clean drinking water are very essential in all places before attempting reclamation.
(iv) Drainage and irrigation projects should be taken up to free the country of malaria.

6. Clearance work has to be taken up urgently. Organised schemes with tractors, bull dozers, may be launched.

Area in hectares available in different countries for reclamation was estimated as follows :—

Philippines	...	200,000	
Indo-China	...	500,000	
Siam	...	400,000	
India	...	810,000	(hectares)
Japan	...	75,000	
China	...	40,000	

(Hectare = 2·47 acres)

Mechanisation: The increasing difficulties experienced in obtaining labour, coupled with shortage of bullock power, make it highly desirable to study the feasibility of using economical and efficient machinery to carry out preparatory tillage, harvesting and threshing. Exchange of information available is very desirable to design the proper machinery for areas having more or less similar economic and climatic conditions. This may help to solve some of these problems efficiently. Where sizable areas of rice land remain to be reclaimed the Governments may initiate comprehensive investigations into the use of farm machinery as a means of bringing this land back into production as rapidly as possible. We further recommend that F. A. O. endeavour to obtain an allocation of tractors and tillage machinery adequate for carrying out these investigations, and that it secure the services of one or more agricultural engineers who are competent in the operation of farm machinery to assist the countries in question in connection with experimental work on the use of power machinery in rice-growing areas.

It is visualised that such experiments would involve determination of the types of land suited for machinery tillage, the types and sizes of machines and equipment that can be used most efficiently, the comparative costs of various operations, the problems of repair and maintenance and the possibilities of utilising such equipment under some system of co-operative or community ownership.

Manures and chemical fertilisers: The present state of knowledge with regard to manure and fertilisers in relation to paddy production is summarised as follows:

1. Green manuring with phosphates gave 10% higher yields over green manuring alone.
2. Under high humidity and high rainfall conditions the most suitable form of readily available nitrogenous fertilisers is Am. sulphate and cyanamide. Am. sulphate gave 15 to 35% increases over no manure in different localities.
3. Prolonged use of single nutrient (Am. sulphate) may be discouraged as it may upset the balance of essential elements in the soil make-up.
4. In Java, Indo-China, Super or rock phosphate gave 25—50% increased yields over no phosphate plots.
5. Japan uses 75 kilograms Nitrogen, 65 kilograms $P_2 O_5$, 47 kilograms $K_2 O$ per hectare (2·6 acre) and gets an average yield of 3·8 metric tons per hectare.

But the two aspects which require solution are: (i) The problem of obtaining adequate supplies of manure especially of Am. sulphate, and (2) the effective distribution and utilisation of such supplies. These have to be solved as best as possible by each country. Mere lack of response to phosphate should not be the deciding factor as to its use. Application to pulse crops in rotation with rice may be a line of investigation that may be taken up.

They therefore recommend that: (i) More experimental work should be carried out by the rice-producing countries to determine the most efficient practices with respect to kinds of fertilisers, rates of application, time and methods of application, and the use of chemical fertilisers in combination with organic manures. Such results as are obtained should be made available to all rice-producing countries.

Plant breeding: Dealing with plant breeding of rice in several countries the following notes were recorded:

1. Traditional methods have secured good results.
2. Pure-line selection in Japan from native varieties and hybrid selections have made it possible to grow rice as far north as Hokkaido.
3. Hybrid progenies gave 10—15% higher yields than pure line selections.
4. Co-ordination in experiments was found to be useful in several countries.
5. Cataloguing the material available in all countries will be a useful line.
6. In addition to yield, disease-resistance, other characters — strong straw, good milling quality, freedom from grain-shattering are to be built up in the strains.
7. New varieties must conform to the general type grown in the area as strains are mostly of limited adaptability.
8. Maintaining as high standard of genetic purity of stocks by replicated progeny row technique.
9. Organisation of Rice Research Workers.
10. As South-East Asia is the original home of rice, collection of all species of Oryza and wild relatives of rice in these regions has to be speeded up.

They then recommend that: Governments in the rice-producing countries delegate to an International Committee or 'working party' of plant breeders, representing the countries concerned, authority to draft a vigorous programme of rice improvement, and that this organised group of plant breeders be given the responsibility of planning a comprehensive rice-breeding programme and making periodic reports on its progress to the Governments concerned. A further responsibility of this group would be to promote the work of preparing the world catalogue of genetic stocks of rice which is being undertaken by F. A. O. and to make provision for maintaining such breeding stocks or rice as are listed in the world.

Rice and Nutrition

The present knowledge with regard to rice nutrition is summarised as follows:

In general it may be said that whole rice has nutritional properties approximately similar to those of other cereals *in a similar state;* it is somewhat superior in certain respects but inferior in others. Like all cereals it is not a complete food and a diet containing rice only will not provide all nutrients. Rice like wheat is a poor source of fat and milling removes most of the fat from both cereals.

1. Undernutrition, malnutrition, and deficiency diseases are common in rice-eating countries. The association between beriberi and the excessive consumption of milled rice has been recognised for fifty years, but the disease has not been eradicated. The improvement of rice diets is a wider problem than the prevention of beriberi.

2. 'Whole' rice resembles in its nutrient content other cereals in a similar state. Milling and house-hold preparation lead to serious losses of nutrients.

3. Under-milled, parboiled and 'enriched' rice provide nutrients lacking in milled raw rice. Improvement in the cleanliness of rice as sold, and the education of the public in better methods of house-hold preparations, will reduce losses occurring as a result of washing and cooking.

4. Typical rice diets contain too much rice in proportion to other foods and are deficient in vitamins of the B group, Vitamin A, calcium, and proteins. Supplements and substitutes which provide these nutrients are needed in greater quantitites. Larger supplies of fish, vegetables, and pulses could readily be made available. It may be nutritionally advantageous to replace milled rice partially by other cereal products which have not been depleted of nutrients to the same degree by milling; excessive replacement of rice by cassava is, however undesirable, because of the low protein content of the latter. Other supplementary feeds which may be of value include food yeast and rice polishing.

5. Insufficiency of the B group vitamins is probably the most important fault of typical rice diets. Emphasis must also be laid on deficiency of vitamin A and calcium. While there is no clinical or physiological evidence that rice diet of adequate calorie-value are deficient in protein, a greater intake of protein by the rice-eater, and the inclusion in his diet of protein derived from foods other than rice in greater quantities, would be advantageous. This is unquestionably true as regards growing children. No satisfactory data are available about the quantities of fat needed by human beings. Fat intake in rice-eating countries is, however, considerably lower than intake in Western countries in general, and it is well known that rice-eaters do increase their fat consumption when circumstances permit. Fat facilitates the absorption of certain vitamins and spares thiamine. In view of these facts an increased intake of fat is desirable.

6. Because of existing agricultural conditions, population pressure on land, and the poverty of rice-eating countries, a substantial increase in the supply of milk, meat, and eggs is scarcely feasible in the immediate future.

Losses in Milling: (i) 15% of the protein present in the husked rice may be lost in milling. (ii) 75% of the thiamine originally present may be lost. Machine milled raw rice contains less than 1·0 mgm. of thiamine per gramme of rice. But under-milled rice does not keep well; and is not acceptable to the consumer, and considerable loss in storage is involved.

The following recommendations are made with regard to milling: (a) It should be possible that the rice milling may be so designed to retain that portion which is rich and at the same time acceptable to the miller. (B) Improved methods in parboiling should be investigated with the aim of providing cheap rice. The method of 'Conversion of rice' is elaborate and expensive. (C) In washing and cooking, the following losses may occur: 10—15% loss of calories; 10% of protein; 80% of thiamine. There is less of losses in washing in parboiled rices. (D) Educational campaigns in cooking and washing which must be related to the customs of the country may be launched.

Rice has to be 'enriched' by treatment in the following elements: (i) Thiamine, (ii) Riboflavin (iii) Vitamin A, Calcium and Vitamins B_2 group. The following enrichment can be made. The premix consists of ordinary white-milled rice which is impregnated with a concentrated solution of vitamins and/or mineral chosen. The impregnated grains are coated with film-forming edible substances which protect vitamin against deterioration and prevent losses in washing. The final enriched product is produced by blending the premix with rice in such proportions as to give the mixture the nutrient content considered desirable on nutritional grounds.

The following definite problems calling for study and action by the several Governments have been included:

(a) Elimination of waste of rice at all stages between production and consumption.

(b) Improvement of rice (nutrient content, keeping qualities, and acceptability) by the development of better milling practices.

(c) Development of improved cheap methods of parboiling with the object of producing parboiled rice which will be acceptable to rice eaters not accustomed to it.

(d) Enrichment of rice with thiamine, riboflavin, other vitamins, and calcium salts. The value of enrichment as a public health measure.

(e) Investigation of simple and convenient methods of estimating thiamine in rice.

(f) Improvement of the nutritive value of rice in connection with variety, cultural conditions, etc.

(g) Improvement and supplementation of rice diets in the various countries along lines suggested by this Committee.

Substitute Foods:— (i) *Roots:* Certain-roots, e. g., cassava and sweet potato, flourish in tropical and sub-tropical countries and give high yields. The superiority of such roots to rice, in respect of yield, is not so great as might appear from their yields on a fresh-weight basis, because the harvested roots have a higher moisture content than rice. Rice usually has a moisture content of about 12 percent whereas that of cassava, as harvested, averages about 60 percent. The following figures illustrate the relation between the calorie yields of rice, cassava, and sweet potato by unit of area:

		Rice Milled	Sweet Potato	Cassava
Estimated average yield (Metric tons) per acre	...	0·37	1·86	1·86
Per hectare	...	0·914	4·59	4·596
Waste allowance (percent)	...	—	19	20
Protein yield (Kilograms)	...	28	27	18
Carbohydrate yield (kilograms)	...	294	413	540
Calories (in thousands) per acre	...	1325	1825	2253
Per hectare	...	3274	4509	5567

(ii) *Soyabeans:* Emulsions of soyabeans are usually prepared so that they contain approximately the same protein as cow's milk and about three times as much Vitamin B, but are poor in vitamin A and D and also in riboflavin and calcium.

Even for the most important staple feeds of the tropics such as rice, maize, millets, the information available on their digestibility is inadequate to justify a change of caloric conversion factors of the present time.

Control of insects and other rice pests: The same set of diseases and pests occur throughout South-East Asia. The F. A. O. is, therefore, recommending that Governments of rice-producing countries, accepting the principle that efficient prevention and control of rice infestation are essential to the conservation of the world's food supply, maintain or establish adequate organisations of trained workers for dealing with infestations at all stages from farm to consumer, with special emphasis on the growing crop, and rice in storage and in transit. Special consideration should be given by Governments to the provision and training of necessary personnel.

Other Topics: *Losses in smuggling, in transport and distribution:*

1. Waste by theft, careless handling and bad packing must be minimised.

2. Controls of unauthorised movements from the country to country.

3. Providing rice-growers with an adequate supply of other food stuffs, necessary material for cultivation.

4. Prevention in losses in quality during transit.

5. Stabilisation of foreign exchange and international conditions for agricultural reconstruction.

6. Strict control over utilisation of rice for industrial purposes.

7. Reduce losses in cooking.

8. Reduction in amount of rice fed to livestock.

Utilisation of fair prices and creation of reserves: Fair price for producer is the greatest incentive for increased production. Cost of production and reasonable margin of profit and the balance between production price and consumers' capacity to pay determine the incentive for production. Creation of reserves is a method of carrying out a price stabilisation. The best location and size of the reserves must be determined. Internal co-operation is necessary for internal allocation of rice. To avoid slumps rational development plans are to be fostered so as to raise the effective level of purchasing power.

Land tenure: Land tenure is a serious obstacle to the economic well-being in many countries. In some countries, rents as high as 75% of the produce result in inefficiency of cultivation. Some far-reaching changes are necessary in the following; (i) economic size of holdings (ii) proper share of profits (iii) alternative occupational opportunities to absorb surplus agricultural workers.

Agricultural Credit: (i) Credit at low interest—short and long term should be provided, through co-operatives and Agricultural Banks. (ii) Enough credit facilities must be available in the country so that the ryot can borrow from a single source; The Co-operative Societies can help in this direction.

Animal Power: There is a shortage of draught animals in many countries. There is also need for a wider exchange of information and in some cases development of new forage grasses and legumes is necessary to get adequate animal power. They therefore, recommend that F. A. O. in consultation with the International Bureau of Epizootics, take the initiative in forming a Far-East Veterinary Committee with the following terms of reference:

(a) To eradicate rinderpest in South-East Asia.

(b) To develop co-operative plans for the production of immunising vaccines and sera and for the maintenance of virulent strains of rinderpest virus.

(c) To co-ordinate the rinderpest eradication programme of countries having common boundaries, the first objective being to prevent the reintroduction of the disease and to minimise the extremely expensive control measures which exist at the present time.

(d) To call meetings of veterinary workers, carry on training programmes for veterinary technicians and facilitate the exchange of information on all phases of rinderpest work.

(e) To establish committee headquarters at a suitable location.

Organisation of scientific and techinical personnel: 1. That an International Committee to set up, to be known as the Far-East Rice Investigation Committee, its personnel to consist of Government-appointed scientists and technicians from each country concerned.

2. That the proposed Committee provide for three sub-committees as follows:— (a) Utilisation and control of water. (b) Machinery and Equipment. (c) Soil, Agronomy and Plant Improvement.

3. That the F. A. O. Regional Office for South East Asia when established take the initiative in organising the proposed Far East Rice Investigation Committee and give the leadership required for its effective functioning.

4. That the proposed committee, together with its sub-committee, meet at least once a year to review the progress and results of investigations, exchange information and experience, decide on the most urgent problems, and plan further investigations for the ensuing year.

Features of Rice Work in Japan and how they differ from those in India

By

K. RAMIAH and MOTI V. VACHHANI
(Central Rice Research Institute, Cuttack)

Rice is the most important single crop in Japan, occupying 7·8 million acres which is 53 per cent of the total annual cultivated area of 15 million acres. The total production of rice is 10·4 million tons giving an average yield of 2,350 lb. (shelled rice) per acre. Due to the importance of rice in the national economy, great attention was given to rice improvement by the Government with the result that during the last 60 years, the area under rice has increased by about 25 per cent while the acre yields during the corresponding period increased by about 70 per cent. Thus the total production increased from 4·9 million tons during 1880 to 10·4 million tons during 1942, i.e. an increase of 113 per cent. It is due to the higher acre yields of rice and other crops that Japan is able to

produce about 80 to 85 per cent of its food requirements for its population of 78 millions from the annual cultivated area of 15 million acres. The cultivated land of Japan consists mostly of coastal plains and narrow river valleys extending up into mountains. The diluvium is usually sandy and sterile, uplands are leached and soils developed on volcanic parent material consisting of acidic lavas and ash are infertile. Thus the soils are generally poor in natural fertility, and soil fertility is apparently thus not a factor for higher acre yields. The high levels of production have been attained and are maintained mostly by the application of results of research in practical farming.

It may be useful to consider the organization of crop research and extension service, which combined with the disciplined and progressive ideology of the cultivating classes and the high percentage of literacy in the country are responsible for such phenomenal results.

The whole country is divided into 46 agricultural districts known as prefectures, each of about 500 square miles. There is a central experimental station at each prefecture and there are 250 technicians for each prefecture or roughly one for each village. This works out to a technical man available to advise for every two to three square miles. These technicians who are either agricultural graduates or sufficiently trained hands maintain the liaison between the farmers and the experimental stations, passing the results of research to the farmers, and bringing to the notice of the research stations the problems of the farmers for investigation. Besides, the agricultural departments of the six Imperial Universities, the Imperial primary, secondary and tertiary branch stations carry out research on specific crops for different ecological regions and pass on the results and the improved varieties to prefectural stations, who after further testing, multiply the seeds on primary seed propagation farms and the co-operative branch stations under the management of the people in the villages. Due to extensive research and extension service organization with a number of small research stations spread all over the country, manned by a large number of technicians, direct contact with the cultivators is possible and the dissemination of results of research to farmers is made easy.

Rice-growing conditions in Japan: Despite the recent urbanization and industrialization, Japan is still a nation of farmers with 43 per cent of households engaged in farming. About 5·4 million farm households are engaged in tilling an area of 15 million acres which works out to about 2·6 acre holding per family. Thus the average holding is very small and the cultivator and his family pay personal attention to cropping, treating it more as a garden than a field. Because of the north latitude, mean temperatures are low, and rice cultivation is confined to the period April to October.

Japan could be divided into four agricultural divisions from the standpoint of rice crop. The extreme southern districts take two successive harvests of rice per year. Central Japan can be divided in two regions, the southern region growing one rice and one dry crop and the northern region raising one crop of rice only, The extreme north, due to its low summer temperatures, is not suitable for rice. Sixty per cent of the rice fields are left fallow during winter. When two successive crops of rice are taken, the farmer uses an early variety for the first crop and a late variety for the second crop. The first crop is sown in nursery beds in late March, transplanted a month later and harvested by early August. The second crop is sown in nursery beds in July and transplanted after the first crop is harvested. The yield of the second crop is about 60 to 70 per cent of the first crop.

In general the rice varieties grown in Japan belong to *O. sativa forma japonica* which usually possess short and stiff straw and have short and coarse grains. The rice crop is classified as paddy rice (lowland rice) and upland rice. The former occupies about 95 per cent of the rice area and is transplanted and irrigated, while the latter is sown broadcast without irrigation. Attempts are being made to see if direct sowing in lines could replace transplanting.

Breeding of improved varieties of rice: Rice breeding in Japan is carried on according to traditional methods of selection, introduction and hybridization. The basic sciences, especially genetics, cytology and plant pathology, have played an important role in developing the improved varieties. Of late much attention is being paid to genetico—ecological approach to plant breeding. By this is meant the determination of the reaction of varieties to specific climatic, edaphic and biotic environmental factors.

Rice breeding work in Japan was started as early as 1893 when the Ministry of Agriculture and Forestry established the Imperial Agricultural Experiment Station in Tokyo and its six branch stations in different districts. They collected 4,000 native rice varieties from all over the country which were carefully examined for various characteristics and yielding capacity. Several superior varieties were thus isolated which became popular and their cultivation extended to wide areas. The pure line selection method was first used in 1910 and because of its simple technique and effective results, the method was adopted on the prefectural and branch stations. This method was very successful and by the year 1922, 490 new strains for various parts of the country were isolated.

Hybridization or cross breeding for rice improvement was first used in 1904 for combining in a single strain the desirable characters of high yield, disease resistance and cold resistance. Certain varieties which

were resistant to the most important rice disease of Japan, caused by *Piricularia oryzae*, were used in the hybridization programme. Up to 1925, 50 new varieties had been developed by this method.

As already mentioned, the hybridization work since 1926 has been remodelled and the new method is mostly based on the genetico-ecological conceptions. For this purpose, the whole country has been divided into ten main ecological districts based chiefly on climatic, soil and biotic factors, each having a local rice research station, called a secondary breeding station. Under this scheme the whole set-up of rice breeding consists of seven primary breeding stations under the control of the Imperial Government, where the programme of breeding, choosing of parents, making the crosses and growing and study of F_1 and F_2 progenies are carried out. The selected F_3 progenies from these stations are distributed to secondary stations, where the behaviour of the F_3 progenies and later generations are studied and the selections made in accordance with the local requirements. These selections are subjected to preliminary trials for yield and resistance to diseases. When the superiority of these is established, they are sent to prefectural stations for final tests and if the results are confirmed, the variety is given a *Norin* number and is taken to seed farms for multiplication and distribution. By this method 16 new *Norin* varieties have been evolved which are widely cultivated.

The success of the rice breeding programme can be gauged by the fact that 69 per cent of the area under rice is grown under improved varieties, 46 per cent under the varieties developed by hybridization and 23 per cent under the varieties developed by pure line selection. According to the estimates of rice experts, the increase in yield of the line selections based on the average of 261 strains was about 9 per cent, whereas the increase in yield of 20 varieties developed by hybridization was about 16 per cent.

Improved cultural practices: *Use of good disease-free seed.* The cultivators are conscious of the advantages of the improved vārieties and renew their seeds very frequently and often every year, which is made possible due to the existence of a large number of agricultural cooperatives, one in each village. The cultivator usually gives his own produce to the co-operatives in exchange for the improved seed he gets.

In order to get assured and uniform germination, the seed is sifted through a sieve and then put in salt water solution to float out the light grains. The seed is treated against fungoid diseases mostly with mercuric compounds before sowing.

Nursery and field practices: Ninety per cent of the rice crop is transplanted and great importance is attached to healthy and vigorous seedlings for transplanting. The nursery area is well-prepared and laid

out in rectangular beds with raised side bunds and having a width of 3½ ft. to 4 ft. and length according to requirements. The seed beds are invariably manured with organic and inorganic manures before sowing. Mostly sprouted seeds are sown either by hand or by special drilling machines which deposit five seeds in each hole. Frequent weeding is done to keep the seed beds free of weeds and the spraying of the seed beds with fungicides and hand-picking of egg masses of insects is a very common practice. In the northern districts where the temperature at planting time is low, hot beds are used to get quicker and satisfactory germination.

The holdings in Japan being small, the land is mostly prepared with hand tools and sometimes with implements driven by animal power. The Japanese cultivator is well disciplined and hard-working and promptly carries out the recommendations of the technicians. The main operations consist of dry ploughing and puddling, irrigation, making bunds and levelling, Liberal doses of both organic and inorganic manures are applied at the time of preparation of land and after transplanting. The transplanting is done mostly in June and July at a distance of 9 in. × 9 in. with 4—5 seedlings per hole. The crop is usually irrigated and 4—5 weedings are given either with hand or with implements, the latter being possible only in fields where the distance between rows is wider. Weeding is considered a very necessary practice, the first weeding being given a fortnight after transplanting, and subsequent ones at an interval of 10 to 15 days.

Harvesting and preparation of the produce: The rice crop is cut close to the ground with sickles as in India. Threshing is either performed by human labour or motor power. Japan has made much progress in designing small power-operated machines for threshing, winnowing and hulling operations. Power threshers are operated by 3-5 h.p. gasoline engines or by electric motors. All operations being performed at the same time. Motor threshers are community-owned and are commonly used by the farmers in the village community.

Application of fertilizers: As stated already the soils of Japan are rather low in fertility and can supply only about two-thirds of the important plant food ingredients necessary to produce a good rice crop. Thus various methods are practised, which are standardised as a result of extensive manurial trials conducted in the country.

Manuring of nursery beds: Complete fertilizers are applied to the nursery before sowing and thoroughly mixed with the soil, On an average, about 5 to 6 lb. of N and 3 to 4 lb. of each of P_2O_5 and K_2O are applied to a seed bed area of 1/25th of an acre which is sufficient to transplant about an acre of paddy field. Wood ashes are applied when the seedlings are about 1 in. in height.

Manuring of paddy fields: From experiments it has been found that application of complete fertilizers gives the best results. Based upon the properties of the soil, the average amount of the main plant food ingredients applied is 80-100 lb. of nitrogen and 70-80 lb. of each of phosphoric acid and potash per acre. They always use a combination of organic and mineral fertilizers.

As regards organic manures there obtains the practice of growing a green manure crop, mainly of soyabean, which is cut and ploughed under about three weeks before transplanting. The amount of green matter thus added varies from three to five tons per acre. The field is then irrigated and often about $\frac{1}{3}$ ton of lime per acre is applied to promote decomposition of the green manure ploughed in. Besides green manure other organic manures like soyabean cake, night soil and composts made from farm wastes are also extensively used. The organic manures are applied to the land before ploughing.

The most effective method and time of application of concentrated manures have been determined from the standpoint of rice physiology. As a result of these investigations two-thirds of the quantity of the ammonium sulphate and phosphate and potash is applied in the dry condition just before puddling and the remaining one-third is applied in two later applications, one about three to four weeks after transplanting, and the other two to three weeks before ears emerge. This is supposed to prevent ammonia escaping as gas from the soil and improve the effectiveness of nitrogen. Ammonium sulphate is the common nitrogenous manure applied, of which about one million tons were produced in Japan before the war. During the war due to the non-availability of sufficient quantities of this fertilizer, the yields are said to have gone down.

According to the Japanese investigations the use of commercial fertilizers and better varieties are dependent upon each other. That is to say, the improved varieties produced in recent years are better only when heavily fertilized and also improved varieties must be grown if the full benefits of fertilizers are to be expected.

The question of water facilities in Japan as compared to what obtains in India may also be considered. Irrigation facilities in Japan are only afforded to the paddy crop and 90 per cent of the crop is irrigated. It is stated that at the time of sowing and transplanting there is always plenty of water available. The sowing and transplanting are carried out expeditiously within a short period during which the assured water is available. There may be difficulty of obtaining water in the later period but this is not considered as serious as scarcity in the earlier stages, as it is known that early and timely planting contributes more to satisfactory yields. In India the failure of early monsoons delays the planting and

ultimately affects the yield adversely and even in canal-irrigated tracts, there is always insufficiency of water in the beginning to get through the planting expeditiously. In fact the canal supplies as in parts of Orissa become plentiful only when the monsoon has set in strongly and there is not very much need for the canal water at that stage.

Rice being the master crop and the characteristic food of the entire population of Japan, the yields have been raised by skilful cultivation, fertilization and scientific seed development. To sum up the main features responsible for higher acre yields can be said to be :

(i) use of improved seeds, (ii) intensive fertilization, (iii) assured supply of irrigation water for the crop, (iv) control of diseases, (v) the large number of technicians available for giving advice (vi) the high percentage of literacy among the people, (vii) the large number of agricultural co-operatives, and (viii) the pesonal attention each cultivator pays to rice cultivation, treating it more as a garden than a field crop.

We can now compare the position of India with that of Japan.

Improved seed: The work of breeding improved varieties is well-advanced in India and in several of the provinces there are improved varieties available suited to the different tracts. The testing of these improved varieties is however not thorough in some of the provinces. This might have to be undertaken immediately so that the areas suited to the different improved varieties could be delimited before an intensive seed distribution organization could be set up. There is also great scope for intensifying breeding in some areas to obtain varieties not only with higher yields but also with improved ancillary characters.

The dearth of sufficient technical personnel will however be an obstacle to overcome, particularly in Bengal, Bihar and Orissa. We shall also require many more experimental stations than what we have. Though there has been considerable improvement in seed multiplication and distribution organization in recent years, we will still be behind Japan for a long time to come before the ideal conditions of each village having a seed area to meet the requirements of the village every year could be reached. It is mainly through the agricultural co-operatives which exist in each village that Japan has reached this ideal condition.

Intensive manuring: This is a more fruitful source of improving production than even improved seed, and in fact in Japaneae agriculture the two always go together to get the maximum benefit. Experience in Madras has always shown that this is the ideal thing to do. The comparative low price of foodgrains was however a great obstacle against cultivators taking up intensive manuring practices with the result that

the best out of the improved varieties could not be realized. Things have however changed and people have become fertilizer conscious, but unfortunately sufficient quantities of fertilizers are not available. The present position is not likely to improve in the very near future. Since the war Japan is also suffering for want of sufficient quantities of fertilizers. The only course left open to us is to exploit other sources. Oilcakes, bone-meal, composts and green manuring can be thought of. Of these, quantities available of the first are not unlimited and it would be more economical to use them in limited quantities in conjunction with the last two. In fact green manuring has proved the best and cheapest form of fertilizing rice everywhere, and there is no doubt that all our efforts at present should be concentrated on popularizing green manuring wherever it can be done. Applying small quantities of fertilizers along with composts or green manure should be the best form of manuring rice.

Although experimental data on manuring practices are not available in India on the scale existing in Japan, we have sufficient information to go on with for the next few years until more critical data as applicable to small individual areas could be obtained. It has to be remembered that the quantities of manurial ingredients, namely nitrogen and phosphoric acid, applied in Japan are roughly three to four times those which we are recommending in India in the 'grow more food' campaign. Experimental evidence available does show that these quantities can be safely increased to twice or even three times the present level in certain tracts of India. The use of night soil, both raw and composted, is very common in Japan whereas it is almost completely wasted in India.

Cultural practices: While transplanting is the universal practice in Japan, in parts of India direct broadcasting still obtains even where facilities for transplanting do exist. How this can be changed needs immediate consideration. Transplanting will be the only way of keeping down weeds which are mainly responsible for lower yields in broadcast fields. Holdings in Japan being small as in India there are not any improved practices of preparing the land which obtain in Japan and which can be usefully copied here. Small improved implements are however used in Japan for threshing, shelling of grain, polishing, etc., and there appears to be definite scope for such improved implements in India too. In fact in Japan all the preparation of the land is done by hand and cattle are used only where the size of the holding is more than three acres. It has to be admitted that the small Indian rice farmer does not put in so much of hard labour in the field as his Japanese opposite does.

Extension service: It is here we find the greatest difference between Japan and India. While we are not far behind Japan in the availability of technical information, it is in the application of such information in

actual cultivation practice that India has to learn from Japan. The organization and the strength of personnel is every different in the two countries. That Japan has a technician for every two or three square miles is something which India cannot hope for even after several years. Even in Indian provinces where there is an agricultural demonstrator for each *taluqa*, there is not much personal contact between him and the farmers. Things have become even worse in recent years as most of the demonstrators' time is taken up in the business aspects of selling seeds, manures, iron, etc.

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Useful Span of Life of the Fowl in India

By

S. G. IYER and S. NARAYANAN
Poultry Research Section,
Indian Veterinary Research Institute, Izatnagar

In commercial poultry farms where economic production is the prime concern layers are seldom kept for table eggs during the second and subsequent years. The common practice is to retain a third of the pullets after the first year of laying for a year more and sell the remaining birds for table. Unfortunately this procedure will not enable the poultry-keeper to test his birds for their breeding worth.

Rice[1] *et al*, working in the Cornell University, analyzed the production records of 1,434 birds over a period of years and observed that careful selection would pay to keep some best hens for commercial production for two or even three years. The number of individuals represented in the averages from the third or fourth year onwards was meagre. Such a practice on the whole was useful for the maintenance of vigour and viability among the flock. In the ordinary circumstances, says Jull,[2] the decline in egg production from year to year is about 20 per cent of the preceding year's production and relatively greater decline in the second year has been experienced in the case of very heavy laying pullets.

Poultry-keepers in India are anxious to know the utility life of the domestic fowl in the tropics and an answer to this being an impending necessity, this note has been prepared.

Age and egg production: The hatching season at Izatnagar in the Uttar Pradesh, extends from November to March when the replacement stocks are usually produced. All the chickens hatched were wing-banded and pedigree records carefully maintained. Routine vaccinations against Fowl-pox and Ranikhet disease were carried out between 8 and 12 weeks of age. The general health of the stock was satisfactory during all stages of growth. At the completion of 24 weeks pullets were selected, transferred to the layer houses and trapnested for one full year with a view to calculate the total annual egg production of individual birds. In the following September, or at the end of the first year of laying, regular culling on the basis of the first year performance was carried out and the selected breeders were mated to sires of known pedigree. No changes in the strain of the three breeds—White Leghorn, Rhode Island Red and the improved indigenous *(Desi)* pullets—were made during the experimental period (1944-48) in order to avoid any possibility of getting variable results by the introduction of fresh blood.

All the birds were fed on balanced layer's ration from maturity onwards. They suffered little or no parasitic infestations. Selected hens were utilized as breeders for three or four years to perpetuate not only the factor for livability among the progeney but also the potentiality for long-term production. The total number of birds maintained for this purpose was small but it could not be helped as the birds had to be culled at all stages so as to remove the boarders; only such of those birds which have survived the strain of production and the environment for longer periods have been considered for the collection of data. Thus, individual birds were trapnested as accurately as possible from the date of first egg

[1] Rice, J. E. Marble, G. O., and Hall, D. B. (1930) *Fudging Poultry for prodnction*, John Wiley & Sons, N. Y.

[2] Jull, M. A. (1928). *Poultry Science*, 7, 226–36.

until the death of the bird or as otherwise stated. Their production records in successive years have been calculated and the decline in egg production with age in the three breeds is given in Table I.

TABLE I

Egg production in the first and subsequent years

White Leghorn				Rhode Island Red				Improved indigenous *(Desi) Fowl)*			
Bird No.	Number of eggs			Bird No.	Number of eggs			Bird No.	Number of eggs		
	First year	Second year	Third year		First year	Second year	Third year		First year	Second year	Third year
264	163	140	57	29	183	151	44	64	187	157	66
701	156	116	100	40	263	181	137	74	182	161	116
77	155	91	46	520	142	78	70	79	130	115	73
				590	145	111	32	99	176	49	68
				120	189	134	79	172	148	138	91
								161	176	120	89
								162	144	112	12
Average egg production for the breed	158	115·7	67·7		184·4	131	72·4		163·3	121·6	73·6
Percentage of decline on the production of the previous year		26·8	41·5		...	28·9	44·7		...	25·5	40·7

Table I shows a definite reduction in the egg production from year to year. Individual birds showed wide variations in the annual decline. Birds that laid well in the first year were inclined to lay better in the second and in some cases third year also. One bird laid more eggs during the third year than in the second. Extremely heavy production in the pullet year was followed by a relatively greater fall in the subsequent years whereas the decline in the case of low producers was relatively less. The greatest decline was noticed in the case of Rhodes in the second year while the indigenous *(Desi)* fowls showed the least decline. The decrease in the third year was exceptionally high in all the three breeds and did not compare favourably with the western standards of 20 per cent annual decline, the influence of environment being obvious. About 45 per cent decline was noticed in the case of Rhodes as compared with the other two breeds. The improved indigenous fowl has behaved just as the light breed in the matter of annual decline in egg production.

Average economic life: The production in the second year in general was quite satisfactory and in several instances the retention of layers for a full period of two years from the date of the first egg was justified, the birds paying for their maintenance. The average economic life of a hen in India, therefore, seems to be two years, though individuals may lay well in the third year also, rendering them most efficient breeders.

Though long-term producers are but few, this character can be well-established in a flock by selective breeding over many generations. Commercial producers who as a rule do not trapnest their birds will be well-advised to retain all the high persistent producers towards the close of the first laying year and thus avoid the concomitant cost of raising new pullets. The inheritance of the ability to lay eggs over a period of years is therefore of tremendous economic importance. Despite the poor fertility combined with low egg production in the oldest stock, the egg size is definitely larger and the chickens hatched have been found to be far superior in respect of vigour and long utility life, whereas the pullet progeny in the long run is likely to suffer from lowered vigour as well as shortened span of life unless proper selection is made. The cockerel for the breeding pens should come from the oldest hens in the flock. As progeny testing depends upon long life together with persistent production it is preferable to use an old but vigorous hen that had proved her worth to transmit desirable qualities to her offspring. By such a practice constitutional vigour and high laying potentialities with little or no chick mortality can be well-established.

[Indian Farming, Vol. XI, No. 2, February, 1950.]

Agricultural News Letter, Madras, May 1950

Season: The most important single factor for Paddy Yield: More than anything else, timely sowing and planting is the important factor for high yield in paddy. By waiting for channel supply and then beginning preliminary cultural operations for raising Kuruvai nursery, the ryots of Tanjore district are not making the maximum effective use of water. The ideal procedure would be to dry-plough the nursery area and bring it to tilth far in advance with the help of summer showers which rarely fail in this tract. Nearly a fortnight before the receipt of channel water, water lifted from wells or ponds may be let into the levelled beds, each not exceeding a cent in area and seeds sown. This method of preparing beds dry and sowing after the first wetting from wells or ponds and levelling immediately as against puddling after receipt of channel water and sowing wet, not only saves precious time at sowing but also advances all other subsequent operations like preparation of fields and planting. Repeated trials on the Agricultural Research Station, Aduthurai have clearly proved the out-standing merits of advancing Kuruvai cultivation by raising nurseries under lift irrigation in respect of grain yield availabiliity of labour etc. The Tanjore ryots are quite alive to this fact, but the

number of those that actually adopt this is extremely few. The early start given to Kuruvai confers immense benefit on the succeeding Thaladi crop as well. Early planted Thaladi crop is invariably more free from the major pests and diseases like "paddy stem borer", "soorai" and "paddy blast" than the late-planted crops. Besides water scarcity is also experienced at the tail end of the season in years of deficient rainfall. Tanjore mirasdars in the double-crop zones would therefore do well to follow the above simple method which is invariably practised on the Agricultural Research Station, Aduthurai.

New areas declared suitable for Ragi strains of Coimbatore: Recent trials conducted with ragi strains have shown that one of these, evolved at the Millet Breeding Station, Coimbatore, is suitable for a very large area in Tiruchirapalli, Tirunelveli and Malabar districts. Ragi Co. 1 as an irrigated crop gave 20% more yield than the local type in Tiruchirapalli taluk. The cultivators are very much satisfied with this strain. Co. 1 and Co. 2 also gave very good results in Kulitalai taluk of the same district. In Tiruchendore taluk, in Tirunelveli district, the short duration strain Co. 3 gave twice as much yield as the local type. Both Co. 1 and Co. 2 were found suitable in parts of Malabar, Co. 1 giving the best result in Calicut and Alattur and Co. 2 giving the highest yield in Palghat taluk. All these strains are being multiplied in seed farms for large-scale distribution.

Make your own malted milk beverage at home: Malted milk beverages are delicious and nutritious. But the imported products that are available in the market are so costly that it is not every one who can afford it. Malted milk made at home is cheap, wholesome and delicious. Take a convenient quantity say two Madras measures of cholam or ragi seeds having a good germination capacity, clean it well removing all extraneous matter. Soak the grains n a bucket of water for 24 hours with intermittent change of water and aeration at least six times. After 24 hours soaking, spread the grains on a tray and keep in a cool place for four days covering it with a wet cloth during the warm period of the day, to allow slow germination. After the fourth day, when the rootlets are about 3/4" long, sun-dry the germinated grains. Remove the husk and sprouts of the germinated grains (malted grains) by gently pounding with a wooden pestle in a wooden mortar. The malted grains should then be roasted gently till a characteristic malted flavour is given out. Grind the roasted malt into a fine powder and pass through a fine sieve (100 mesh per inch). Preserve the fine malt powder (malt food) in air-tight containers. To prepare malted milk beverage, mix two teaspoonfuls of malt food with about two table-spoonfuls of hot water just on the boil, into a paste in a cup, pour in hot milk, stir briskly; add sugar to taste and serve hot.

D. D. T. for control of mango hopper pest: The mango crops depends upon (i) satisfactory flowering of trees, (ii) proper setting of flowers without damage by insect pests, fungi and adverse climatic conditions and (iii) factors encouraging retention of fruits set, such as the absence of gale etc. We have varieties in mango that flower almost regularly and have satisfactory bearing. It is common experience however, that in spite of satisfactory flowering the flowers may get infested with mango hoppers. All these years fishoil resin soap was used for controlling the mango hopper pest. A better chemical for controlling the pest is now available in the Guesarol 550 (D. D. T. 50% wettable) used at a strength of 1/2 ounce per gallon of water. It kills the nymphs and adults of the hopper pest and can also be used as a preventive. A tree may require 1 to 3 gallons of fluid depending on the size, costing two to four annas. Generally one spraying is enough to save a tree from this pest. Guesarol 550 spraying was undertaken on an extensive scale in Chittoor and Cuddapah districts this year and has given complete satisfaction to mango growers there.

Value of Pedigree Seed in Cotton: Five samples from Uganda 1 cotton crop raised under irrigation in the "*masipattam*" season of 1949 were collected from different villages in Srivilliputtur taluk. This sample represented the harvests from three stages of departmental seed supply from the multiplication schemes of Uganda 1 cotton and grown from bazaar seeds purchased locally. These samples were sent to the Director, Technological Laboratory, Bombay for the estimation of their staple length, fibre weight, ginning percentage and spinning capacity. The results given below are self-explanatory.

Source of seed supply	Fibre length in inch	Ginning %	Fibre weight · millionth of an oz.	Spinning value in counts
1. Self fertilised pedigree seed from Cotton Breeding Station, Coimbatore and growth in Srivilliputtur taluk – Stage I	1·03	32	0·140	45's
2. First generation of the pedigree seed grown in Srivilliputtur taluk – Stage II	0·95	33	0·147	40's
3. Second generation of the pedigree seed grown in Srivilliputtur taluk – Stage III	0·93 0·93	32 31	0·161 0·132	37's 38's
4. Local seed from bazaar grown in Srivilliputtur taluk Stage IV	0·96	32	0·144	33's

The best quality and spinning performance were obtained from the sample raised from the pedigree seeds, while the worst was got from the seed purchased locally. The ryots are therefore advised in their own interest to use the Departmental seed of Uganda 1 cotton for sowing. Uganda 1 cotton seeds are always available with the Special Agricultural Demonstrator, Uganda 1 scheme, Srivilliputtur.

Potato cultivation on the Nilgiris — Use of cattle power to reduce cultivation charges: Cultivation of potato in the Nilgiris is done entirely by manual labour. The land is prepared by forking it with digging forks. The earthing up of potatoes and harvesting is done by men and women with *guddalies*. The preparation of land requires 40 men for forking and 40 women for breaking clods and this is a heavy item of expenditure. At the Agricultural Research Station, Nanjanad, most of the cultural operations are done by animal power and implements. The land is ploughed with Victory plough, ridges and furrows are formed by double mould board ploughs. Covering the seed and earthing up are done by a smaller double mould board plough. The potato digger is employed for harvesting the crop. By the use of these mechanical means there is a saving or Rs. 71/- per acre as shown below:

Farm Method		Ryots' Method	
1. Ploughing with Victory plough twice 8 pairs at Rs. 3–8–0 per pair	28—0—0	Forking land and breaking clode 40 men at Rs. 1–4–0 and 40 women at Re. 1/-	90—0—0
2. Earthing up potatoes 1 pair	3—8—0	Earthing up potatoes 10 men at Rs. 1–4–0	12—8—0
	31—8—0		102—8—0

One pair of animals can manage about 15 acres of land, 10 acres of main crop and 5 acres of second crop, which means a saving of at least Rs. 1000/- per year. Taking the maintenance of an animal at Rs. 700/- per annum, there is a net saving of Rs. 300/- per annum, and this in the course of three or four years would cover the initial investment on animals and implements. The cattle power is not only cheaper, but also more efficient. Increased yields have been obtained by the farm method than by the ryots' method. By the use of cattle power it is also possible to grow a green manure crop and incorporate the same into the soil to keep up the fertility of land. The ryots are therefore advised to adopt mechanical means in the cultivation of potato.

Promising strain of groundnut for rainfed cropping: As a result of breeding work carried out at the Agricultural Research Station, Tindivanam, a number of high-yielding strains of groundnut have been evolved. These were tested in ryots, fields in the districts of Tiruchirapalli. South Arcot, North Arcot, Salem, Chittoor, ceded districts, etc., in the South-West monsoon season, without irrigation under ryots' conditions. Of these, Tindivanam 3 A. H. 698, a pure line isolated from a West African variety "Bassi" has been found to record consistently higer yields over the local, the increase, varying from 20 to 30 per cent. It is a spreading type with a duration of 130 to 135 days. Its high out-turn of kernels (76 per cent) and good natural test weight of pods (1 lb. 7oz. per Madras measure) are additional points in its favour. The pods of this strain are found very near the surface of the soil. This fact together with the smooth cylindrical nature of its pods make harvesting comparatively easy. (From The Dirctor of Information & Publicity, Madras)'

How to kill an Association — It is quite easy!

Any association of people, rural, industrial or otherwise, depends for its existence almost entirely upon the good will and co-operation of its members. Yet it is surprising how often members of an association frequently and without the slightest wish to undermine their body's strength, do it as much damage unconciously as any deliberate wrecker could hope for. The following twelve rules are regarded as stout nails in a coffin for any association – perhaps all the stouter for the fact that few members realise their danger.

Don't attend meetings. If you do attend come late.

If the weather does not suit you, don't dream of attending.

If ever you attend, find fault with the officers and other members; sit at the back and talk with the man next to you about the weather.

Never accept office. It is much easier to criticise than do something.

Get sore if you are not appointed to a committee; but if you are appointed do not attend any meetings.

If asked by the chairman for your opinion on some matter, just tell him you have nothing to say – then, after the meeting, tell everyone how things ought to have been done.

Do nothing more than is absolutely necessary, but when other members roll up their sleeves and do it all, howl about how the association is run by a clique.

Hold back your subscription as long as you possibly can, so as to give the secretary some unnecessary work.

Start a whispering campaign about the finances.

Don't bother about getting new members, let some one else do it.

Never subscribe to your journal. This bucks up the editor to enable him to make constant improvements. *(From "The Agricultural Gazette of New South Wales" Page 154 - March, 1950).* M. V.

DIPLONA IN INDIAN HORTICULTURE.

Results of the Final Examination—August 1950.

Serial No.	Register No.	Name of Candidate	Rank	Class in which placed	Distinction
1.	1.	Sri T. S. Shanmugham ...	14	III	Fruit diseases.
2.	2.	,, A. R. Krishnaswami ...	15	III	...
3.	3.	,, I. K. Sambasiva Rao ...	4	II	...
4.	4.	,, V. Ramakrishnan ...	11	III	Fruit products.
5.	5.	,, K. P. Padmanabha Nambiar ...	3	II	Fruit products.
6.	6.	,, R. Bettai Gowder ...	17	III	...
7.	7.	Janab A. Azimuddin ...	19	III	...
8.	8.	Sri K. Subba Rao* ...	...	...	FAILED.
9.	9.	,, L. Krishnan ...	6	II	Fruit pests.
10.	10.	,, N. V. Raja Rao ...	7	II	Fruit pests.
11.	11.	,, R. Narayanamurthi ...	2	II	Fruit diseases.
12.	12.	,, C. Venkatachalam ...	10	III	Fruit pests, fruit products.
13.	13.	,, V. Nanjappa Maniagar ...	16	III	Fruit pests.
14.	14.	,, R. Ramanathan ...	8	II	Fruit diseases, fruit pests.
15.	15.	,, K. Raghavan ...	13	III	Fruit pests, fruit products.
16.	16.	,, J. Samuel Sundaraj ...	5	II	Olericulture.
17.	17.	,, M. L. Viswanath ...	18	III	Fruit products.
18.	18.	,, M. V. Rama-somayajulu ...	12	III	Fruit products.
19.	19.	,, V. N. Madhava Rao ...	1	I	Individual fruit-crops, fruit products, products, olericulture.
20.	20.	,, K. Sambamurthy ...	9	III	Fruit pests.

*This candidate has been permitted by the Director of Agriculture to appear for the tests in August 1951.

Fruit Specialist,
Chairman of the Board of Examiners.

First Class: 1.
Second ,, 7.
Third ,, 11.

Crop and Trade Reports

Maximise Production through Fertilisers: Government have sanctioned a scheme for the intensive distribution of Chemical fertilisers — Ammonium sulphate and Super phophate in the deltaic areas of East Godavari, West Godavari, Krishna, Guntur, Nellore, Tanjore Tiruchirapalli, Madhurai and Tirunelveli where water supply is assured. They have programmed to distribute a total quantity of 100,000 tons of ammonium sulphate in conjunction with phosphates in these areas. Their intention is that, out of this quantity, the major portion should be utilised for the long duration crop of paddy which has been sown already in most districts.

The following special facilities have been provided under the scheme. Takkavi loans will be liberally granted to needy agriculturists in order to enable them to purchase the chemical fertilisers. A large additional staff consisting of one Special District Agricultural Officer and several Agricultural Demonstrators, Maistries and Fieldmen has been sanctioned for each of these nine districts, so that the disbursement of loans may be effected speedily and the ryots instructed, when necessary, on the mode of application of these fertilisers. The fertilisers will be taken within easy reach of the agriculturists. The loans will be free of interest and will be granted on the personal security of the ryots concerned. Agricultural Demonstrators will provide every assistance to the ryots for obtaining these loans for purchasing these fertilisers. If 100,000 tons of ammonium sulphate are applied to the paddy crop, there will be an additinal production 2,00,000 tons of rice, and this will go a long way towards supplying the food requirements of the State.

The ryots are therefore advised to make full use of the special facilities granted to them and thus make a substantial contribution towards achieving self-sufficiency in food grains.

100 lbs. of ammonium sulphate and 50 lbs. super phophate should be applied to each acre under paddy, the former as top dressing one month after planting, with a good basal dressing of green or green leaf manure at 2,000 — 3,000 lbs. per acre, or ordinary cattle manure at 10 cart-loads per acre in the absence of green manures, and the latter just before planting. This will easly secure an additional production of 300 lbs. of paddy (2 bags) per acre. The increased profit to the ryot will be Rs. 25/- per acre. (Issued by the Commissioner of Food Production).

Weather Review — For August 1950

RAINFALL DATA

Division	Station	Total for the month in inches	Departure from normal in inches	Total since January 1st in inches
Orissa & Circars.	Gopalpur	2·6	—5·1	29·7
	Calingapatnam	6·1	—0·7	19·3
	Visakhapatnam	1·6	—3·6	16 0
	Anakapalle*	3·8	—1·0	17·0
	Samalkot*	4·1	—1·0	19·9
	Kakinada	5·4	—0·2	18·5
	Maruteru*	6·5	+0·3	23·0
	Masulipatnam	2·8	—3·5	18·0
	Guntur*	4·2	+0·1	20·2
	Agrl. College, Bapatla*	3·7	—1·9	15·2
	Rentachintala	5·0	+1·5	11·2
Ceded Dists.	Kurnool	6·8	+2·3	20·1
	Nandyal*	2·8	—2·4	14·8
	Hagari*	4·3	+1·9	11·2
	Siruguppa*	6·4	+3·0(a)	11·4
	Bellary	6·9	+4·5	11·6
	Cuddapah	3·9	—1·3	9·0
	Kodur*	2·0	—2·2	8·3
Carnatic.	Nellore	1·9	—1·1	10·7
	Buchireddipalem*	4·0	+2·0	8·6
	Madras (Meenambakkam)	8·3	+3·7	17·5
	Tirurkuppam*	5·5	-0·3 @	13·7
	Palur*	7·0	+2·2	15·3
	Tindivanam*	1·8	—2·6	10·0
	Cuddalore	4·1	—0·7	12·1
Central.	Vellore	5·4	—0·3	10 2
	Gudiyatham*	4·0	—1·1	6·9
	Salem	8·0	+1·4	17·3
	Coimbatore (A. C. R. I.)*	2.7	+1·2	9·6
Central—*Contd.*	Coimbatore (C. B. S.)*	2·7	+1·0	9·8
	Coimbatore	2·3	+1·1	8·3
	Tiruchirapalli	8·1	+4·0	15·2
South.	Nagapattinam	6·1	+3·0	15·3
	Aduturai*	6·0	+2·5	14·0
	Pattukottai*	5·7	+2·3	16·8
	Mathurai	10·9	+6·8	20·0
	Pamban	1·3	+0·7	8·7
	Koilpatti*	1·5	—0·6	11·8
	Palayamcottai	Nil	—0·7	10·6
	Ambasamudram*	0·5	Nil (x)	13·8
West Coast.	Trivandrum	10·8	+6·1	42·9
	Fort Cochin	14·6	+0·7	99·0
	Pattambi*	13·2	—1·3	133·4
	Taliparamba*	19·4	—6·6	124·1
	Nileshwar*	22·4	—2·0	133·4
	Pilicode*	17·0	-5·1@	116·5
	Mangalore	12·3	-13·2	116·4
	Kankanady*	12·2	-14·9	118·4
Mysore & Coorg.	Chitaldrug	4·7	+1·3	12·6
	Bangalore	5·2	+0·2	13·1
	Mysore	4·0	+0·7	18·7
	Mercara	27·5	+0·7	99·6
	Kodaikanal	11·9	+4·9	29·7
Hills.	Coonoor*	7·4	+3·1	26·5
	Ootacamund*	10·9	+5·7	26·4
	Nanjanad*	10·7	+3·1	37·9

Note:—

(1) * Meteorological Stations of the Madras Agricultural Department.

(2) Average of ten years data is taken as the normal.

(3) @ Average of seven years data for Tirurkuppam and eight years data for Pilicode is given as normal.

(4) (a) Taluk office normal is 3·55″ and rainfall is 4·26″.

(5) (x) Actual deviation is — 0·02″

Weather Review for August, 1950

The month commenced with a weak Arabian Sea branch of the monsoon, but with a fairly active monsoon in Rayalaseema and Travancore-Cochin. On 2—8—50 the monsoon was active along the coastal Andhradesa. Two days later the Arabian Sea branch of the monsoon showed signs of strengthening along the Konkan Coast. On 7—8—50 conditions became unsettled at the head of the Bay of Bengal. On the same day the Arabian Sea branch of the monsoon became active along and near the Kanara Coast. The next day the unsettled conditions developed into a depression and the Bay of Bengal branch of the monsoon became active south of Latitude 20° N. and the Arabian Sea branch also became active and remained so for two days. In the Bay of Bengal a feeble cyclonic circulation was noted on 19—8—50. Even then both the branches of the monsoon were weak.

Both in the South Bay of Bengal and South-east Arabian Sea signs were favourable on 23—8—50 for the revival of the monsoon. For the succeeding four days monsoon was active in some part or other of the Bay of Bengal. On 28—8—50 the monsoon became strong in the South-east Arabian Sea. On the same day it was also noted that the monsoon trough was tending to establish itself in its normal position. During the remaining period the monsoon was fairly active in the Bay of Bengal.

The month ended with the possibility of the weather becoming unsettled in the North-east Bay of Bengal. There is nothing worth recording regarding variations in temperature. The chief falls in the month are as detailed below :—

Serial No.	Date	Place	Rainfall in inches
1	1—8—50	Kurnool	2·6
2	8—8—50	Alleppey	2·9
3	9—8—50	Calingapatnam	2·7
4	20—8—50	Nagapattinam	3·8
5	23—8—50	Madhurai	3·4
6	25—8—50	Bellary	4·2
7	28—8—50	Madras (Meenambakkam)	3·6

Agricultural Meteorology Section,
Lawley Road Post, Coimbatore
Dated, 18—9—1950.

M. B. V. N., C. B. M., & M. V. J.

Departmental Notifications

GAZETTED SERVICE—POSTINGS AND TRANSFERS

Name of Officers	From	To
Sri Achutha Rama Raju, D.	Special D. A. O., Bellary	Supdt. Agricultural Farm, Bapatla.
,, Kanti Raj, M.	On leave,	H. Q. Dy. D. A., Madras.
,, Kesava Iyengar, N.	Asst. Cotton Specialist, Coimbatore,	Asst. Cotton Extension Officer, Coimbatore.
,, Mirza Amser Baig,	J. L. A., Bapatla,	Special D. A. O., Bellary.
,, Narasimham, M.	On leave,	J. L. A., Bapatla.
,, Parameswara Menon, P. K.	D. A. O., Cuddapah,	D. A. O., Cuddalore.
,, Reddy, D. V.	Dy. D. A., Vizagapatam,	D. A. O., Cuddapah.
,, Sakharama Rao, G.	Lecturer, Agrl., Coimbatore,	Dy. D. A., Vizagapatam.
,, Subbiah Mudaliar, V. T.	H. Q. Dy. D. A., Madras,	S. L. in Agri., Coimbatore.

SUBORDINATE SERVICE

Name of Officers	From	To
Sri Antony, C.	Ginger Asst., Pattambi,	A. D., Mangalore.
,, Chandrasekharan, P.	Asst. in Entomology, Coimbatore,	F. M., Central Farm, Coimbatore.
,, Ebenezer, J.	A. D., Madurantakam,	Addl. A. D.. Madurantakam.
,, Guruswami Raju, V. D.	A. D., Paramakudi,	Marketing Asst., Trichy.
,, Govindan Nair, K. V.	On leave,	F. M. A. R. S., Nileshwar.
,, Kolandaivelu Naicker, R.	A. D., Madurantakam,	A. D , Paramakudi.
,, Krishnan, L.	Marketing Asst:, Trichy,	A. D., Madurantakam.
,, Krishnan, S.	Addl. A. D., Madurantagam,	Asst. in Chemistry, Coimbatore.
,, Kannan Nambiar, P.	On leave,	Asst. A. R. S., Pattambi.
,, Kunhi Kannan Nambiar,	On leave,	F. M. A. R. S., Taliparambu.
Adi Raja Kanniah, D.	Fieldman, Grade II Millet, Coimbatore,	Seed Develop (Millet), Coimbatore.
Sri Krishnaswami,	A. D., Tirukoilur,	A. D., Tanjore.
,, Lakshmipathi Bao, S.	Special A. D., Punganur,	F. M. Sugarcane Liaison Farm, Samalkot.
,, Leela David, A. Mrs.	On leave,	Asst. in Entomology, Coimbatore.
,, Madhava Rao, S.	A. D., Madanapalle,	A. D., Vayalpad.
,, Purnalingam Pillai, M.S.	On leave,	Addl. A. D., Sivaganga.
,, Ratnakar Batkal,	A. D., Puthur,	F. M., Livestock Farm, Koila.
,, Rangammannar,	Soil Conservation Asst.,	A. D., Madanapalle.
,, Radhakrishnan, K. B.	Soil Conservation Asst.,	Asst. in Meteorology, A. R. S., Hagari.

Name of Officers.	From	To
Sri Ramaswami, P.	Asst. in Cotton, Koilpatti,	Special Marketing Asst., Koilpatti.
,, Ramakrishnan, V.	Stipending Student in Horticulture,	Fruit Inspector, Kodur.
,, Ratnam, C.	Asst. in Chemistry, Coimbatore,	Asst. in Analytical Work, Coimbatore.
,, Samuel, D. M.	Asst. in Chemistry, Coimbatore,	Soil Survey Scheme, Ceded Dt.
,, Sridhara Sastri,	A. D., Masulipatam,	P. A. to D. A. O., Vijayawada.
,, Sundara Rao, Y. N.	Fruit Inspector, Kodur,	Fruit Asst. F. R. S., Kodur.
,, Suryanarayana Chetty, M.	Asst. in Cotton, Sattur,	Special Marketing Asst., Sattur.
,, Subramaniam, R.	On leave,	Special A. D., Manure, Musiri.
,, Satyanarayana-murthi, K.	Asst. in Meteorology, A. R. S., Hagari,	Asst in Western Cotton Scheme, Hagari.
,, Subbarayan, P. T.	F. M. A. R. S., Taliparambu,	Asst. in Chemistry, Coimbatore.
,, Suryanarayana-murthi, H.	Soil Conservation Asst.,	A. D., Madanapalle.
,, Surappa Naidu, A.	Addl. A.D., Gannavaram,	Addl. A. D., Narasapatam.
,, Sambasiva Rao, P. V.	On leave,	A. D., Karur.
,, Suryanarayana-Iyer, P. S.	P. P. A., (Mycology) Calicut,	Addl. A. D., Namakkal.
,, Thiruvenkada-chary, T. E.	A. D., Kallakurichi,	A. D., Tirukoilur.
,, Sri Vasudeva Menon, K.	Asst. in Chemistry, Coimbatore,	Soil Survey Scheme, Ceded Districts.
,, Venkateswara Rao, Y.	A. D., Vayalpad,	A. D., Masulipatam.
,, Venkateswara Rao, A.	Addl. A. D., Tanuku,	Coconut Nursery, A. R. S., Maruteru.
,, Velmurugan, R.	Seed Develop Millet, Coimbatore.	F. M., Mewami, Gobi Taluk.
,, Venkataraman, G.	On leave,	Special A. D., Madanapalle.
,, Venkataswami, T.	A. D., Kovur,	A. D., Tanuku.

THE ANNUAL GENERAL BODY MEETING
OF THE
MADRAS AGRICULTURAL STUDENTS' UNION

The annual meeting of the General Body of the Union was held on 31st July, at 2-30 P. M. in the Conference Hall at the Agricultural Research Institute, Coimbatore, with the President, Sri C. M. John, in the chair.

Sixty-five officer-members and 85 student-members were present. After the Minutes of the previous meeting were read and adopted, the Secretary, Sri U. Achutha Wariar, read the Report of the Managing Committee of the Union for the period 1949—'50. This was adopted and then the printed Auditors' Report was taken up for consideration. A few points that came up for discussion, such as the method of accounting for the subscriptions that are received from members from time to time, were explained by the Secretary. In the Budget estimate for 1950—'51, an amount of Rs. 250/- had been set apart for repairs to the curtains used in the College Day Entertainments. The Secretary was directed to reduce the closing balance by this amount.

The election of office bearers for the year 1950—'51 was then taken up and the following were elected.

Council (16 Members)

President	:	Sri C. M. John, Principal, Ex-officio President.
Vice-President	:	Sri C. S. Krishnaswami.
Editor	:	Sri T. R. Narayanan.
Secretary	:	Sri T. S. Lakshmanan.

Mofussil Vice-Presidents:

Sri V. T. Subbaiah Mudaliar.
„ S. N. Venkataraman.
„ D. Viswanatha Reddy.

Mofussil Members:

Sri K. Ramaswami.
„ P. C. Sahadevan.
„ K. Rama Rao.
„ M. R. Balakrishnan.

Resident Members

Sri K. C. Thomas.
,, D. Marudarajan.
,, S. Ramachandran.
,, M. Sundaram — Club Secretary, Students' Club (ex-officio)
,, C. D. Samuel (Student)

Managing Committee (10 Members)

Resident Vice-President.
Editor.
Secretary.
Sri G. Rangaswami (Manager) Vice Sri M. M. Krishna-Marar resigned on 22—8—50.
,, K. Kuppamuthu (Treasurer)
,, K. Meenakshisundaram (Member)
,, U. Achutha Wariar ,,
,, M. Vaidyanathan ,,
,, M. Sundaram, Secretary, Students' Club (ex-officio)
,, L. Robinson (Student)

Editorial Board (8 Members)

Editor.
Secretary.
Manager.
Dr. N. Krishnaswami.
Sri S. Sampath.
,, C. Balasubramania Mudaliar.
,, M. Sundaram, Secretary, Students' Club, (ex-officio)
,, P. Chandra Mohan (Student)

THE MADRAS AGRICULTURAL JOURNAL

HINTS TO CONTRIBUTORS

The pages of the Madras Agricultural Journal shall be open ordinarily only to the members of the Madras Agricultural Students' Union.

All articles for publication should be addressed to the Editor, Madras Agricultural Journal, Lawely Road P. O., Coimbatore.

In view of the high cost of printing contributions should be as concise as possible and should conform to the best usage in the leading Journals published in India and abroad.

Manuscripts should be typed with double spacing on one side of the paper only and with wide margin. They should not ordinarily exceed 5,000 words or 12 pages of printed matter including tables and illustrations in the Journal. Manuscripts should be carefully revised; numerical data and calculation checked. Main headings in the text should be typed in capitals with paragraph indentations and followed by a period and two hyphens. Sub-heads should be lower case and be underlined to indicate italics. Latin nomenclatures and local terms etc., should be in italics. Original papers must conclude with a summary of not more than 300 words drawing attention to the main facts and conclusions.

Tables: The number of tables should be restricted to those absolutely necessary, as numerous tables detract from the readability of the article. Each table should be numbered consecutively from 1 up and must have a heading stating its contents clearly and concisely. The tables are to be typed on separate sheets, with their positions marked in the text.

Illustrations: Wherever possible illustrations should be made with pen and Indian ink for reproduction as line blocks. The name of the author, title of the article and figure number should be written on the back of each figure in blacklead pencil. Each figure should have a legend typed on a separate sheet.

Photographs: Photographs and wash drawings are more expensive as half tone blocks are necessary. The cost of blocks is chargeable to the author of the article. Photographs submitted as illustrations should be unmounted, glossy prints of good quality, with strong contrasts, trimmed so as to include only the essential features to be illustrated. They should preferably be of the same size as desired in the printed paper. Photographs should always be packed flat, never rolled or folded.

Line drawings: Line drawings, and charts should be prepared in twice the scale desired in the printed form. All letterings, figure numbers and explanatory letters in graphs should be light face and large enough to be 1/16" high in the finished illustrations.